What is claimed is:

1. A method for controlling a process comprising the steps of:

a) receiving plant measurement variables from a regulatory control system;

b) applying said plant measurement variables to update one or more variables of a nonlinear model;

c) linearizing said updated nonlinear model; and

d) passing a MPC format model converted from said linearized model to a model predictive controller.

2. The method of Claim 1 wherein said updated nonlinear model is linearized when a change in said one or more of said model variables has exceeded an associated predetermined threshold.

3. The method of Claim 1 wherein said updated nonlinear model is linearized when one or more model prediction errors in said MPC format model currently operational in said model predictive controller has exceeded an associated predetermined threshold.

4. The method of Claim 1 wherein said step of applying said plant measurement variables to update said one or more variables of a nonlinear model includes the step of pretreating said plant measurement variables and using said pretreated plant measurement variables to update said nonlinear model variables.

5. The method of Claim 4 wherein:

said updated nonlinear model is linearized when a change in said one or more of said model variables has exceeded an associated predetermined threshold; and

said step of passing a MPC format model converted from said linearized model to a model predictive controller is replaced by the steps of:

converting said linearized model to a full order state space model;

creating from said full order state space model a state space model having fewer states than said full order state space model;

converting said fewer states state space model to a MPC format model; and

evaluating the performance of said MPC format model with the tuning for a presently existing model of said process in a model predictive controller versus the performance of said presently existing model with said tuning and either:

passing said MPC format model with said presently existing model tuning to a model predictive controller when said performance evaluation of said MPC format model exceeds a first predetermined limit; or

computing new tuning for said MPC format model when said performance evaluation falls below said first predetermined limit and repeating said evaluating step; or

returning said MPC format model to said step of creating a MPC format model having fewer states than said full order state space model to change the number of states in said MPC format model when said performance of said MPC format model falls below said first predetermined limit.

6. The method of Claim 4 wherein:

said updated nonlinear model is linearized when a change in said one or more model prediction errors in said MPC format model currently operational in a model predictive controller has exceeded an associated predetermined threshold; and

said step of passing a MPC format model

converted from said linearized model to a model predictive controller is replaced by the steps of:

converting said linearized model to a full order state space model;

creating from said full order state space model a state space model having fewer states than said full order state space model;

converting said fewer states state space model to a MPC format model; and

evaluating the performance of said MPC format model with the tuning for a presently existing model of said process in said model predictive controller versus the performance of said presently existing model with said tuning and either:

passing said MPC format model with said presently existing model tuning to a model predictive controller when said performance evaluation of said MPC format model exceeds a first predetermined limit; or

computing new tuning for said MPC format model when said performance evaluation falls below said first predetermined limit and repeating said evaluating step; or

returning said MPC format model to said step of creating a MPC format model having fewer states than said full order state space model to change the number of states in said MPC format model when said performance of said MPC format model falls below said first predetermined limit.

7. The method of Claim 4 wherein:

said updated nonlinear model is linearized when a change in said one or more of said model

variables has exceeded an associated predetermined threshold; and

said step of passing a MPC format model converted from said linearized model to a model predictive controller comprises the step of:

evaluating the performance of said MPC format model with the tuning for a presently existing model of said process in a model predictive controller versus the performance of said presently existing model with said tuning and either:

passing said MPC format model with said presently existing model tuning to a model predictive controller when said performance evaluation of said MPC format model exceeds a first predetermined limit; or

computing new tuning for said MPC format model when said performance evaluation of said MPC format model falls below said first predetermined limit and repeating said evaluating step.

8. The method of Claim 4 wherein:

said updated nonlinear model is linearized when a change in said one or more model prediction errors in said MPC format model currently operational in a model predictive controller has exceeded an associated predetermined threshold; and

said step of passing a MPC format model converted from said linearized model to a model predictive controller comprises the step of:

evaluating the performance of said MPC format model with the tuning for a presently existing model of said process in said model predictive controller versus the performance of said presently existing

model with said tuning and either:

passing said MPC format model with said presently existing model tuning to a model predictive controller when said performance evaluation of said MPC format model exceeds a first predetermined limit; or

computing new tuning for said MPC format model when said performance evaluation of said MPC format model falls below said first predetermined limit and repeating said evaluating step.

9. The method of Claim 4 wherein said step of applying said plant measurement variables to update variables of a nonlinear model further includes the step of reconciling said pretreated plant measurement variables and using said reconciled and pretreated plant measurement variables to update said nonlinear model variables.

10. The method of Claim 9 wherein:

said updated nonlinear model is linearized when a change in said one or more of said model variables has exceeded an associated predetermined threshold; and

said step of passing a MPC format model converted from said linearized model to a model predictive controller is replaced by the steps of:

converting said linearized model to a full order state space model;

creating from said full order state space model a state space model having fewer states than said full order state space model;

converting said fewer states state space model to a MPC format model; and

evaluating the performance of said

MPC format model with the tuning for a presently existing model of said process in a model predictive controller versus the performance of said presently existing model with said tuning and either:

passing said MPC format model with said presently existing model tuning to a model predictive controller when said performance evaluation of said MPC format model exceeds a first predetermined limit; or

computing new tuning for said MPC format model when said performance evaluation falls below said first predetermined limit and repeating said evaluating step; or

returning said MPC format model to said step of creating a MPC format model having fewer states than said full order state space model to change the number of states in said MPC format model when said performance of said MPC format model falls below said first predetermined limit.

11. The method of Claim 9 wherein:

said updated nonlinear model is linearized when a change in said one or more model prediction errors in said MPC format model currently operational in a model predictive controller has exceeded an associated predetermined threshold; and

said step of passing a MPC format model converted from said linearized model to a model predictive controller is replaced by the steps of:

converting said linearized model to a full order state space model;

creating from said full order state space model a state space model having

fewer states than said full order state space model;

converting said fewer states state space model to a MPC format model; and

evaluating the performance of said MPC format model with the tuning for a presently existing model of said process in said model predictive controller versus the performance of said presently existing model with said tuning and either:

passing said MPC format model with said presently existing model tuning to a model predictive controller when said performance evaluation of said MPC format model exceeds a first predetermined limit; or

computing new tuning for said MPC format model when said performance evaluation falls below said first predetermined limit and repeating said evaluating step; or

returning said MPC format model to said step of creating a MPC format model having fewer states than said full order state space model to change the number of states in said MPC format model when said performance of said MPC format model falls below said first predetermined limit.

12. The method of Claim 9 wherein:

said updated nonlinear model is linearized when a change in said one or more of said model variables has exceeded an associated predetermined threshold; and

said step of passing a MPC format model converted from said linearized model to a model predictive controller comprises the step of:

evaluating the performance of said MPC format model with the tuning for a

presently existing model of said process in a model predictive controller versus the performance of said presently existing model with said tuning and either:

passing said MPC format model with said presently existing model tuning to a model predictive controller when said performance evaluation of said MPC format model exceeds a first predetermined limit; or

computing new tuning for said MPC format model when said performance evaluation falls below said first predetermined limit and repeating said evaluating step.

13. The method of Claim 9 wherein:

said updated nonlinear model is linearized when a change in said one or more model prediction errors in said MPC format model currently operational in a model predictive controller has exceeded an associated predetermined threshold; and

said step of passing a MPC format model converted from said linearized model to a model predictive controller is replaced by the step of:

evaluating the performance of said MPC format model with the tuning for a presently existing model of said process in said model predictive controller versus the performance of said presently existing model with said tuning and either:

passing said MPC format model with said presently existing model tuning to a model predictive controller when said performance evaluation of said MPC format model exceeds a first predetermined limit; or

computing new tuning for said MPC

format model when said performance evaluation falls below said first predetermined limit and repeating said evaluating step.

14. The method of Claim 1 wherein said step of passing a MPC format model converted from said linearized model to a model predictive controller is replaced by the steps of:

i. converting said linearized model to a full order state space model;

ii. creating from said full order state space model a state space model having fewer states then said full order state space model;

iii. converting said fewer states state space model to a MPC format model; and

iv. passing said MPC format model to a model predictive controller.

15. The method of Claim 1 wherein said step of passing a MPC format model converted from said linearized model to a model predictive controller is replaced by the steps of:

i. converting said linearized model to a simplified MPC format model; and

ii. passing said simplified MPC format model to a model predictive controller.

16. The method of Claim 14 said step of passing said MPC format model to a model predictive controller comprises the step of:

evaluating the performance of said MPC format model with the tuning for a presently existing model of said process in a model predictive controller versus the performance of said presently existing model with said tuning and either:

(i) passing said MPC format model with said presently existing model tuning to said model predictive controller when said performance evaluation of said MPC

format model exceeds a first predetermined limit; or

(ii) returning said MPC format model to said step of creating a MPC format model having fewer states than said full order state space model to change the number of states in said MPC format model when said performance evaluation for said MPC format model falls below said first predetermined limit.

17. The method of Claim 14 wherein said step of passing said MPC format model to a model predictive controller comprises the step of:

evaluating the performance of said MPC format model with the tuning for a presently existing model of said process in a model predictive controller versus the performance of said presently existing model with said tuning and either:

(i) passing said MPC format model with said presently existing model tuning to said model predictive controller when said performance evaluation exceeds a first predetermined limit; or

(ii) computing new tuning for said MPC format model when said performance evaluation falls below said first predetermined limit and repeating said evaluating step; or

(iii) returning said MPC format model to said step of creating a MPC format model having fewer states than said full order state space model to change the number of states in said MPC format model when said performance evaluation for said MPC format model falls below said first predetermined limit.

18. A method for controlling a process comprising the steps of:

a) converting a nonlinear model to a linear model for operation of a model predictive controller;

b) using said nonlinear model in a real time optimizer to compute targets for said model predictive controller; and

c) passing said targets to said controller.

19. A method for controlling a process comprising the steps of:

a) converting at least one submodel of a nonlinear model having two or more submodels to a linear model, each of said two or more submodels having a predetermined one of two or more model predictive controllers associated therewith, said linear model for operating said associated one of said two or more controllers;

b) using said nonlinear model in a real time optimizer to compute targets for all of said two or more model predictive controllers, a predetermined subset of said computed targets associated with a respective one of said two or more controllers;

c) passing each of said predetermined subsets of said computed targets associated with a respective one of said two or more model predictive controllers to said associated one of said two or more controllers; and

d) passing said linear model to said associated one of said two or more controllers.

20. The method of Claim 19 wherein:

said converting step is replaced by the following steps:

receiving plant measurement variables from a regulatory control system;

pretreating said plant measurement variables;

reconciling said pretreated plant measurement variables;

using said reconciled and pretreated plant measurement variables to update one or more variables of each submodel of a nonlinear model, said nonlinear model having two or more of said submodels, each of said two or more submodels having a predetermined one of two or more model predictive controllers associated therewith; and

converting at least one updated submodel of said updated nonlinear model to a linear submodel when a change in said one or more of said updated submodel variables has exceeded a predetermined threshold, said linear submodel for operating said associated one of said two or more controllers; and

said step of passing a linear model to said associated one of said two or more controllers is replaced by the following steps:

converting said at least one linearized submodel to a full order state space submodel;

creating from said full order state space submodel a state space submodel having fewer states than said full order state space submodel;

converting said fewer states state space submodel to a MPC format submodel; and

evaluating the performance of said MPC format submodel with the tuning for a presently existing submodel of said process in said associated one of said two or more model predictive controllers versus the performance of said presently existing submodel with said tuning and either:

passing said MPC format submodel with said presently existing submodel tuning to said associated one of said two or more model

predictive controllers when said performance evaluation of said MPC format submodel exceeds a first predetermined limit; or

computing new tuning for said MPC format submodel when said performance evaluation of said MPC format submodel falls below said first predetermined limit and repeating said evaluations step; or

returning said MPC format submodel to said step of creating a MPC format submodel having fewer states than said full order state space submodel to change the number of states in said MPC format submodel when said performance of said MPC format submodel falls below said first predetermined limit.

21. The method of Claim 19 wherein:

said converting step is replaced by the following steps:

receiving plant measurement variables from a regulatory control system;

pretreating said plant measurement variables;

reconciling said pretreated plant measurement variables;

using said reconciled and pretreated plant measurement variables to update one or more variables of each submodel of a nonlinear model, said nonlinear model having two or more of said submodels, each of said two or more submodels having a predetermined one of two or more model predictive controllers associated therewith; and

converting at least one updated submodel of said updated nonlinear model to a linear submodel when a change in one or more model prediction errors in an associated one of one

or more MPC format submodels currently operational in an associated one of said two or more model predictive controllers has exceeded a predetermined threshold, said linear submodel for operating said associated one of said two or more controllers; and

said step of passing a linear model to said associated one of said two or more controllers is replaced by the following steps:

converting said at least one linearized submodel to a full order state space submodel;

creating from said full order state space submodel a state space submodel having fewer states than said full order state space submodel;

converting said fewer states state space submodel to said MPC format submodel; and

evaluating the performance of said MPC format submodel with the tuning for a presently existing submodel of said process in said associated one of said two or more model predictive controllers versus the performance of said presently existing submodel with said tuning and either:

passing said MPC format submodel with said presently existing submodel tuning to said associated one of said two or more model predictive controllers when said performance evaluation of said MPC format submodel exceeds a first predetermined limit; or

computing new tuning for said MPC format submodel when said performance evaluation of said MPC format submodel falls below said first predetermined limit and repeating said evaluations step; or

returning said MPC format submodel to said

step of creating a MPC format submodel having fewer states than said full order state space submodel to change the number of states in said MPC format submodel when said performance of said MPC format submodel falls below said first predetermined limit.

22. The method of Claim 19 wherein:

said converting step is replaced by the following steps:

receiving plant measurement variables from a regulatory control system;

pretreating said plant measurement variables;

reconciling said pretreated plant measurement variables;

using said reconciled and pretreated plant measurement variables to update one or more variables of each submodel of a nonlinear model, said nonlinear model having two or more of said submodels, each of said two or more submodels having a predetermined one of two or more model predictive controllers associated therewith; and

converting at least one updated submodel of said updated nonlinear model to a linear submodel when a change in said one or more of said updated submodel variables has exceeded a predetermined threshold, said linear submodel for operating said associated one of said two or more controllers; and

said step of passing a linear model to said associated one of said two or more controllers comprises the steps of:

evaluating the performance of said MPC format submodel with the tuning for a presently existing submodel of said process in said

associated one of said two or more model predictive controllers versus the performance of said presently existing submodel with said tuning and either:

passing said MPC format submodel with said presently existing submodel tuning to said associated one of said two or more model predictive controllers when said performance evaluation of said MPC format submodel exceeds a first predetermined limit; or

computing new tuning for said MPC format submodel when said performance evaluation of said MPC format submodel falls below said first predetermined limit and repeating said evaluating step.

23. The method of Claim 19 wherein:

said converting step is replaced by the following steps:

receiving plant measurement variables from a regulatory control system;

pretreating said plant measurement variables;

reconciling said pretreated plant measurement variables;

using said reconciled and pretreated plant measurement variables to update one or more variables of each submodel of a nonlinear model, said nonlinear model having two or more of said submodels, each of said two or more submodels having a predetermined one of two or more model predictive controllers associated therewith; and

converting at least one updated submodel of said updated nonlinear model to a linear submodel when a change in one or more model prediction errors in an associated one of one

or more MPC format submodels currently operational in an associated one of said two or more model predictive controllers has exceeded a predetermined threshold, said linear submodel for operating said associated one of said two or more controllers; and

said step of passing a linear model to said associated one of said two or more controllers comprises the steps of:

evaluating the performance of said MPC format submodel with the tuning for a presently existing submodel of said process in said associated one of said two or more model predictive controllers versus the performance of said presently existing submodel with said tuning and either:

passing said MPC format submodel with said presently existing submodel tuning to said associated one of said two or more model predictive controllers when said performance evaluation of said MPC format submodel exceeds a first predetermined limit; or

computing new tuning for said MPC format submodel when said performance evaluation of said MPC format submodel falls below said first predetermined limit and repeating said evaluating step.

24. A method for controlling a process comprising the steps of:

a) applying simulation stimuli to update one or more variables of a nonlinear model;

b) linearizing said updated nonlinear model;

c) converting said linearized model to a MPC format model; and

d) passing said MPC format model to a model predictive controller.

25. The method of Claim 24 wherein

said step of applying said simulation stimuli to update one or more variables of a nonlinear model includes the steps of pretreating said simulation stimuli; then reconciling said pretreated simulation stimuli; and then using said reconciled and pretreated simulation stimuli to update said nonlinear model;

said updated nonlinear model is linearized when a change in said one or more of said model variables has exceeded an associated predetermined threshold; and

said step of passing a MPC format model converted from said linearized model to a model predictive controller is replaced by the steps of:

converting said linearized model to a full order state space model;

creating from said full order state space model a state space model having fewer states than said full order state space model;

converting said fewer states state space model to a MPC format model; and

evaluating the performance of said MPC format model with the tuning for a presently existing model of said process in a model predictive controller versus the performance of said presently existing model with said tuning and either:

passing said MPC format model with said presently existing model tuning to a model predictive controller when said performance evaluation of said MPC format model exceeds a first predetermined limit; or

computing new tuning for said MPC format model when said performance evaluation falls below said first predetermined limit and repeating said evaluations step; or

returning said MPC format model to said step of creating a MPC format model having fewer states than said full order state space model to change the number of states in said MPC format model when said performance of said MPC format model falls below said first predetermined limit.

26. The method of Claim 24 wherein

said step of applying said simulation stimuli to update one or more variables of a nonlinear model includes the steps of pretreating said simulation stimuli; then reconciling said pretreated simulation stimuli; and then using said reconciled and pretreated simulation stimuli to update said nonlinear model;

said updated nonlinear model is linearized when a change in said one or more model prediction errors in said MPC format model currently operational in a model predictive controller has exceeded an associated predetermined threshold; and

said step of passing a MPC format model converted from said linearized model to a model predictive controller is replaced by the steps of:

converting said linearized model to a full order state space model;

creating from said full order state space model a state space model having fewer states than said full order state space model;

converting said fewer states state space model to a MPC format model; and

evaluating the performance of said MPC format model with the tuning for a presently existing model of said process in said model predictive controller versus the performance of said presently existing model with said tuning and either:

passing said MPC format model with said presently existing model tuning to a model predictive controller when said performance evaluation of said MPC format model exceeds a first predetermined limit; or

computing new tuning for said MPC format model when said performance evaluation falls below said first predetermined limit and repeating said evaluations step; or

returning said MPC format model to said step of creating a MPC format model having fewer states than said full order state space model to change the number of states in said MPC format model when said performance of said MPC format model falls below said first predetermined limit.

27. The method of Claim 24 wherein

said step of applying said simulation stimuli to update one or more variables of a nonlinear model includes the step of pretreating said simulation stimuli; then reconciling said pretreated simulation stimuli; and then using said reconciled and pretreated simulation stimuli to update said nonlinear model;

said updated nonlinear model is linearized when a change in said one or more of said model variables has exceeded an associated

predetermined threshold; and

said step of passing a MPC format model converted from said linearized model to a model predictive controller comprises the step of:

evaluating the performance of said MPC format model with the tuning for a presently existing model of said process in a model predictive controller versus the performance of said presently existing model with said tuning and either:

passing said MPC format model with said presently existing model tuning to a model predictive controller when said performance evaluation of said MPC format model exceeds a first predetermined limit; or

computing new tuning for said MPC format model when said performance evaluation falls below said first predetermined limit and repeating said evaluations step.

28. The method of Claim 24 wherein

said step of applying said simulation stimuli to update one or more variables of a nonlinear model includes the step of pretreating said simulation stimuli; then reconciling said pretreated simulation stimuli; and then using said reconciled and pretreated simulation stimuli to update said nonlinear model;

said updated nonlinear model is linearized when a change in said one or more model prediction errors in said MPC format model currently operational in a model predictive controller has exceeded an associated predetermined threshold; and

said step of passing a MPC format model converted from said linearized model to a model

predictive controller comprises the step of:

evaluating the performance of said MPC format model with the tuning for a presently existing model of said process in said model predictive controller versus the performance of said presently existing model with said tuning and either:

passing said MPC format model with said presently existing model tuning to a model predictive controller when said performance evaluation of said MPC format model exceeds a first predetermined limit; or

computing new tuning for said MPC format submodel when said performance evaluation falls below said first predetermined limit and repeating said evaluations step.

29. Apparatus for controlling a process having process measurement variables associated therewith, said apparatus comprising:

a) a digital processor;

b) a model predictive controller having a model for said process therein; and

c) a simulation environment routine having a nonlinear model therein, said simulation environment routine executed by said digital processor for:

(i) applying process measurement variables to update one or more variables of said nonlinear model;

(ii) linearizing said updated nonlinear model; and

(iii) passing a MPC format model converted from said linearized nonlinear model to said model predictive controller.

30. The apparatus of Claim 29 further comprising a regulatory control system for controlling said process

according to said MPC format model and providing said process measurement variables to said simulation environment routine.

31. Apparatus for controlling a process having process measurement variables associated therewith, said apparatus comprising:

a) a digital processor;

b) a model predictive controller having a model for said process therein; and

c) a simulation environment routine having a nonlinear model therein, said simulation environment routine executed by said digital processor for:

(i) converting said linear model to said nonlinear model; and

(ii) using said nonlinear model in a real time optimizer to compute targets for said model predictive controller; and

(iii) passing said targets to said model predictive controller.

32. The apparatus of Claim 31 further comprising a regulatory control system for controlling said process according to said targets passed to said model predictive controller.

33. Apparatus for controlling a process having process measurement variables associated therewith, said apparatus comprising:

a) a digital processor;

b) two or more model predictive controllers each having an associated submodel of a linear model having two or more submodels for said process therein; and

c) a simulation environment routine having said nonlinear model therein, said simulation environment routine executed by said digital processor for:

(i) converting at least one submodel of a nonlinear model having two or more submodels to said associated linear submodel;

(ii) using said nonlinear model in a real time optimizer to compute targets for all of said two or more model predictive controllers, a predetermined subset of said computed targets associated with a respective one of said two or more model predictive controllers;

(iii) passing each of said predetermined subsets of said computed targets associated with a respective one of said two or more model predictive controllers to said associated one of said two or more controllers; and

(iv) passing said linear submodel to said associated one of said two or more controllers.

34. The apparatus of Claim 33 further comprising a regulatory control system for controlling said process according to said predetermined subsets of said computed targets passed to said associated one of said two or more controllers.

35. Apparatus for controlling a process having process measurement variables associated therewith, said apparatus comprising:

a) a digital processor;

b) a model predictive controller having a model for said process therein; and

c) a simulation environment routine having a nonlinear model therein, said simulation environment routine executed by said digital processor for:

(i) applying simulation stimuli to update

one or more variables of said nonlinear model;

(ii) linearizing said updated nonlinear model; and

(iii) passing a MPC format model converted from said linearized nonlinear model to said model predictive controller.